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Transmitted herewith for filing is the patent application of
INVENTOR OR APPLICATION IDENTIFIER: Jong Sun HAN
TITLE: METHOD FOR CONTROLLING CALL ACCESS OF TERMINAL IN MOBILE COMMUNICATION SYSTEM

Enclosed are:

1. [X] 18 pages of specification, claims, abstract
2. [X] 4 sheets of FORMAL drawing.
3. [X] 2 pages of newly executed Declaration & Power of Attorney (original).
4. [X] Priority Claimed.
5. [] Small Entity Statement.
6. [] Information Disclosure Statement, Form PTO-1449 and reference.
7. [X] Assignment Papers for LG Information & Communications, Ltd. (cover sheet, assignment & assignment fee).
8. [X] Certified copy of Korean Patent Application No. 16025/1998 filed May 4, 1998.
9. [X] Two (2) return postcards.
[X] Stamp & Return with Courier.
[X] Prepaid Postcard-Stamped Filing Date & Returned with Unofficial Serial Number.
10. [X] Authorization under 37 C.F.R. §1.136(a)(3).
11. [] Other:

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- [] This is a Continuation-in-part (CIP) of prior application No: _____ filed _____. Incorporation By Reference-The entire disclosure of the prior application is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.
- [] Amend the specification by inserting before the first line the sentence:
--This application is a continuation-in-part of Application Serial No. _____ filed _____.--
- [X] A check in the amount of \$760.00 (Check #7104) is attached.
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METHOD FOR CONTROLLING CALL ACCESS OF TERMINAL IN MOBILE COMMUNICATION SYSTEM

BACKGROUND OF THE INVENTION

Field of the Invention

5 The present invention relates to a method for controlling call access of a terminal in a mobile communication system based on cellular communication system, and more particularly, to a method for controlling call access of a terminal in a mobile communication system to improve efficiency of a given channel capacity under multimedia communication environments which transmit data at multi-transmission rate.

Background of the Related Art

15 Related art call access procedures in a mobile communication system based on IS-95A cellular code division multiple access (CDMA) system will be described with reference to Fig. 1.

 Fig. 1 is a flow chart illustrating the related art call access procedures.

20 Referring to Fig. 1, a base station broadcasts a pilot channel, a synchronous channel, and a paging or broadcasting channel to allow all of mobile terminals in its own cell or sector (a1, b1, c1). For transmitting data, the mobile terminal

requests call access of the base station through an access channel (d1). The base station assigns a channel to allow call access according to request of the mobile terminal in a cell or sector of the base station, if call capacity in a reverse channel is within a set threshold value. While the base station does not assign a channel if the call capacity is greater than the threshold value (e1). Afterwards, the base station and the mobile terminal transmit and receive a preamble and real data therebetween (g1, h1).

In the related art mobile communication system based on IS-95A cellular CDMA system, a radio channel is varied depending on the call capacity. At this time, the mobile terminal may not identify information of variable Walsh codes. Accordingly, it is difficult for the base station to assign Walsh codes to a mobile terminal which requests call access after interference of a reverse link has been increased. If the mobile terminal tries new call access under the circumstances that communication quality becomes poor as above, it is likely to increase interference of the radio channel and also fail call access.

On the other hand, to solve such problems, in a next generation mobile communication system, each base station serves to control call access of the mobile terminal. In other words, the base station periodically notifies the state of a current radio channel capacity to all of mobile terminals in the same cell or sector. That is to say, the base station periodically monitors overall received power of the reverse link and

periodically transmits monitoring results to all of mobile terminals in the same cell or sector. At this time, the base station transmits a busy/idle bit through a broadcasting channel BCCH, which is indicating whether a current channel capacity is
5 a busy state or an idle state.

If interference of the current reverse link is smaller than the threshold value since traffic amount in the reverse link is small, the base station transmits the idle bit indicating that the current reverse link is in idle state to all the mobile terminals in the same cell or sector through the broadcasting channel, so as to allow the mobile terminals to try call access. By contrast, if interference of the reverse link is greater than the threshold value since traffic amount in the reverse link increases, the base station transmits the busy bit indicating that the current reverse link is in busy state to all the mobile terminals in the same cell or sector through the broadcasting channel so as to prohibit the mobile station from trying call access. All the mobile terminals in a service area of the base station receive the idle/busy bit from the base
10 station and try call access depending on the state of the reverse link in the current base station.

If the mobile terminal additionally requests call access under the circumstances that interference of the reverse link is increased more than the threshold value, the base station
15 ignores call access request from all the mobile terminals regardless of service options. This is to prevent quality of the

overall communication channel from being deteriorated due to interference resulted from the base station allows new call access.

However, the aforementioned related art mobile communication system based on IS-95A cellular CDMA system has several problems in application for a communication system which supports multi-transmission rate depending on service options of the mobile terminal. The base station is required to assign Walsh code having different periods depending on types of transmission data, such as voice, image, text and the like, because the period of Walsh code assigned for the duration of one data symbol in a forward link is varied according as transmission rate is varied. As aforementioned, the period of Walsh code is varied depending on transmission rate and a group of Walsh codes having the same period is called as a code class.

Under the communication environment, if a plurality of mobile terminals in the same cell or sector request communication service with the same service options at the almost same time, a resource of Walsh code class corresponding to the service option of the mobile terminal becomes exhausted before interference of the reverse link exceeds the set threshold value.

Therefore, in case that the related art communication system is applied to a communication system which supports multimedia communication services, it is difficult to control individual call access to each code class, thereby failing to

efficiently manage the resource of the radio channel. In that case, the mobile terminal may not identify its available code class and thus should receive the available code class through service negotiation. For this reason, overhead for service negotiation increases, thereby increasing interference due to unnecessary communication in the radio channel.

SUMMARY OF THE INVENTION

Accordingly, the present invention is directed to a method for controlling call access of a terminal in a mobile communication system based on cellular communication system, that substantially obviates one or more of the problems due to limitations and disadvantages of the related art.

An object of the present invention is to provide a method for controlling call access of a terminal in a mobile communication system based on cellular communication system, in which call access of mobile terminals can efficiently be controlled depending on the state of individual resources of Walsh code classes assigned to each mobile terminal from the base station and the state of a reverse link in a communication system which supports multi-transmission rate depending on service options of the mobile terminals.

Additional features and advantages of the invention will be set forth in the description which follows, and in part will be apparent from the description, or may be learned by practice of the invention. The objectives and other advantages of the

invention will be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

To achieve these and other advantages and in accordance with the purpose of the present invention, as embodied and broadly described, a method for controlling call access of a terminal in a mobile communication system includes the steps of permitting a base station to periodically broadcast call access control information including traffic information of a reverse link and information of at least one or more code classes in which Walsh codes assigned to a mobile station from the base station are classified depending on transmission rate, to a plurality of mobile terminals in its cell or sector, and permitting the mobile terminal to periodically receive the call access control information and requesting call access of the base station depending on the call access control information.

In another aspect, a data frame structure used for a method for controlling call access of a terminal includes a link busy/idle field indicating whether or not interference of a reverse link transmitted to a mobile terminal from a base station exceeds a preset threshold value, and a code class busy/idle field indicating whether or not a plurality of Walsh code classes are used.

It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory and are intended to provide further explanation

of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this specification, illustrate 5 embodiments of the invention and together with the description serve to explain the principles of the invention.

In the drawings:

Fig. 1 is a flow chart illustrating call access procedures in a related art mobile communication system based on IS-95A cellular CDMA system;

Fig. 2 shows a data frame used for assignment of a busy/idle bit in a broadcasting channel according to the present invention;

Fig. 3 shows call access operation in a mobile communication system based on cellular CDMA system according to one embodiment of the present invention; and

Fig. 4 is a flow chart illustrating call access control procedures in a mobile communication system based on cellular 20 CDMA system according to one embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are

illustrated in the accompanying drawings.

In a communication system according to the present invention, a plurality of code classes consisting of a group of Walsh codes having different periods are classified and assigned to a base station in response to properties of current available transmission rate and data amount. Therefore, each base station transmits system information to all the mobile terminals depending on the state of an individual resource of Walsh code classes in a radio channel and traffic of a reverse link, as shown in Fig. 3. The system information includes a link busy/idle field 10 and a code class busy/idle field 20.

The link busy/idle field 10 indicates whether or not interference of the reverse link transmitted to the mobile terminal from the base station exceeds a preset threshold value. The code class busy/idle field 20 indicates whether or not a plurality of Walsh codes classes are available.

For example, if the interference exceeds the threshold value, a value of one bit assigned to the link busy/idle field 10 is set to "1" that is indicative of busy state, so as to cause all the mobile terminals not to request call access.

Also, a plurality of bits 0 to 6 assigned to the code class busy/idle field 20 are respectively set to "0" or "1" to indicate "idle state" or "busy state" depending on the state of Walsh codes which are available for each Walsh code class. At least one bit can be assigned to each code class depending on service options previously selected by a user terminal. In the present

invention, a priority order is given in the order of code classes having short code length. For example, the highest priority is given to a code class having the shortest code length. In Fig. 2, high priority order is obtained as the code class goes up to 6 from 0. That is to say, the code length becomes longer as the code class goes up to 0 while the code length becomes shorter as the code class goes up to 1. In this regard, if there are provided two or more Walsh code classes, high Walsh code class having a relatively short code length has a relative higher priority order in comparison with low Walsh code class having a relatively long code length.

Therefore, in a communication system which supports multi-transmission rate to assign a plurality of code classes, if a plurality of mobile terminals request call access, a relative priority order is given to each code class assigned to mobile terminals. If the high code class is busy, call access may be requested by low code classes. However, the lowest code class of the low code classes is busy, the base station ignores call access request.

The link busy/idle field 10 and the code class busy/idle field 20, which are broadcasting through a forward link, are transmitted to each mobile terminal through a broadcasting channel BCCH. As an example of such a broadcasting channel, there is provided the broadcasting channel BCCH, as defined by International Telecommunication Union-Radio Sector (ITU-R), used for a mobile communication system based on CDMA system or a

5 paging channel of IS-95. In case of the BCCH, the period of transmission for the busy/idle bit is determined per super frame unit. In case of the paging channel, the period of transmission for the busy/idle bit is determined per slot cycle unit. Since super frame or slot cycle is used, overhead occurring due to transmission of the link busy/idle field 10 and the code class busy/idle field 20, can almost be ignored.

A preferred embodiment according to the present invention will now be described with reference to Figs. 3 and 4.

Referring to Figs. 3 and 4, a base station B1 transmits information having the data frame structure shown in Fig. 2 to all the mobile terminals in its cell at a predetermined time period. The base station B1 notify the link busy/idle field 10 whether or not interference of the reverse link transmitted to the mobile terminal from the base station exceeds a preset threshold value. The base station B1 also notify the link busy/idle field 10 whether or not each Walsh code class is used through respective bits 0 to 6 of the code class busy/idle field 20.

20 For example, it is assumed that Walsh code classes classified by 0 to 6 are assigned to the base station B1. It is also assumed that Walsh code classes from 0 to 2 in the base station B1 are all assigned to terminals of other users (i.e., the all Walsh code classes are busy) and Walsh code classes from 25 3 to 6 are idle. In this case, if interference of the reverse link does not exceed the threshold value, the base station B1

sets bit values corresponding to the code classes from 0 to 2 of the code class busy/idle field 20 of the broadcasting channel to "1", respectively, and sets other bit values to "0", respectively, so that the bit values are transmitted to all the mobile terminals in a cell C1.

The mobile terminal receives call access control information transmitted from the base station (S2) and determines whether the state of the reverse channel is busy or idle (S3). If the current reverse channel is busy, the mobile terminal waits for until the reverse channel reaches idle state (S4). While, if the reverse channel is idle state, the mobile terminal identifies the state of an individual Walsh code resource of each code class (S5), so that call access is implemented by an available code class.

For example, it is assumed that service options of the mobile terminal M1 in the cell C1 or sector have been applied to support code classes from 3 to 6, service options of the mobile terminal M2 have been applied to support code classes from 2 to 5, and service options of the mobile terminal M3 have been applied to support code classes from 0 to 2. In this case, if the three mobile terminals M1-M3 request call access at the almost same time, the results are as follows.

First, the mobile terminal M1 tries call access to the highest code class 3. The highest code class 2 of the mobile terminal M2 is exhausted. Therefore, the mobile terminal M2 tries call access to the code class 3 having a next lower

priority than the code class 2 by one level. Meanwhile, the mobile terminal M3 does not try call access because Walsh code resource of all the code classes 0 to 2 assigned to the mobile terminal M3 is exhausted, and continues to monitor the broadcasting channel so as to try call access when any Walsh code resource of the code classes 0 to 2 is idle.

As aforementioned, according to the present invention, in the communication system which transmits transmission data at multi-transmission rate depending on data properties and data amount, the base station transmits the state of an individual Walsh code classes assigned depending on data transmission rate and the state of the reverse link to all the mobile terminals in its cell or sector through the broadcasting channel or the call channel. Accordingly, each mobile terminal implements call access request depending on individual state of Walsh code classes and the state of the reverse link. If call access request is implemented, call access can optimally be controlled depending on priority order of code classes. Also, since the busy/idle bit is transmitted through the broadcasting channel or the paging channel for the unit of super frame or paging channel slot cycle, overhead due to transmission of the busy/idle bit is almost ignored.

As aforementioned, the method for controlling call access of a terminal in a mobile communication system based on cellular communication system has the following advantages.

Call access requested by each mobile terminal can

efficiently be controlled so as to restrict unnecessary interference signal from being generated in the overall reverse link, thereby improving efficiency of the given radio communication channel. Also, communication quality of service
5 provided from the overall communication system is improved as call access control is implemented.

It will be apparent to those skilled in the art that various modifications and variations can be made in the method for controlling call access of a terminal in a mobile communication system based on cellular communication system according to the present invention without departing from the spirit or scope of the invention. Thus, it is intended that the present invention covers the modifications and variations of the invention provided they come within the scope of the appended claims and their equivalents.

What is claimed is:

1. A method for controlling call access of a terminal in a communication system comprising the steps of:

broadcasting at a base station at least two or more call
5 access control information to a plurality of mobile stations in its cell or sector; and

receiving at a corresponding mobile stations the call access control information and performing call access request at the base station depending on the call access control information.

2. The method as claimed in claim 1, wherein the call access information includes interference information of a reverse link, and information of at least one or more code class in which Walsh codes assigned to the mobile station from the base station are classified depending on transmission rate.

3. The method as claimed in claim 2, wherein the interference information of the reverse link compares overall received power from the plurality of mobile stations in the cell or sector of the base station with a predefined threshold value,
20 and then selectively indicates whether a current reverse channel is idle or busy.

4. The method as claimed in claim 2, wherein the

information of the code classes indicates individually whether the state of each code class is idle or busy.

5 5. The method as claimed in claim 2, wherein the plurality of code classes have relative priority orders if a code length of each code class is different.

6. The method as claimed in claim 2, wherein the call access information are transmitted ~~through~~ a broadcasting channel per super frame period.

7. The method as claimed in claim 2, wherein the call access information are transmitted ~~through a~~ paging channel per slot cycle period.

8. The method as claimed in claim 2, wherein the mobile station uses a code class having the highest priority if the mobile station requests call access of the base station.

9. The method as claimed in claim 2, wherein, if the reverse link included in the call access control information, the mobile station identifies the state of an individual resource of the code class so as to implement call access using a code class assigned to oneself among code classes which are idle.

10. A method for controlling call access of a terminal in a communication system, comprising the step of broadcasting at a base station call access control signal including interference information of a reverse link and information of at least one or more code class in which Walsh codes assigned to mobile stations from the base station are classified depending on transmission rate, to a plurality of mobile stations in its cell or sector.

11. The method as claimed in claim 10, wherein the information of each code class indicates whether the state of each code class is idle or busy.

12. A data frame structure used for controlling call access of a terminal in a communication system, comprising:

a link busy/idle field indicating whether or not interference of a reverse link transmitted to a mobile terminal from a base station exceeds a preset threshold value; and

a code class busy/idle field indicating whether or not a plurality of Walsh code classes are available.

13. The data frame structure as claimed in claim 12, wherein the code class busy/idle field individually indicates whether the state of each code class is idle or busy.

14. The data frame structure as claimed in claim 12,

wherein the code class have relatively higher priority orders if
a code length of each code class is different.

ABSTRACT OF THE DISCLOSURE

In a method for controlling call access of a terminal in a mobile communication system based on cellular communication system, call access of mobile terminals can efficiently be controlled depending on the state of individual resources of Walsh code classes assigned to each mobile terminal from the base station and the state of a reverse link in a communication system which supports multi-transmission rate depending on service options of the mobile terminals. The method for controlling call access of a terminal in a mobile communication system includes the steps of permitting a base station to periodically broadcast call access control information including traffic information of a reverse link and information of at least one or more code classes in which Walsh codes assigned to a mobile station from the base station are classified depending on transmission rate, to a plurality of mobile terminals in its cell or sector, and permitting the mobile terminal to periodically receive the call access control information and requesting call access of the base station depending on the call access control information.

FIG.1
related art

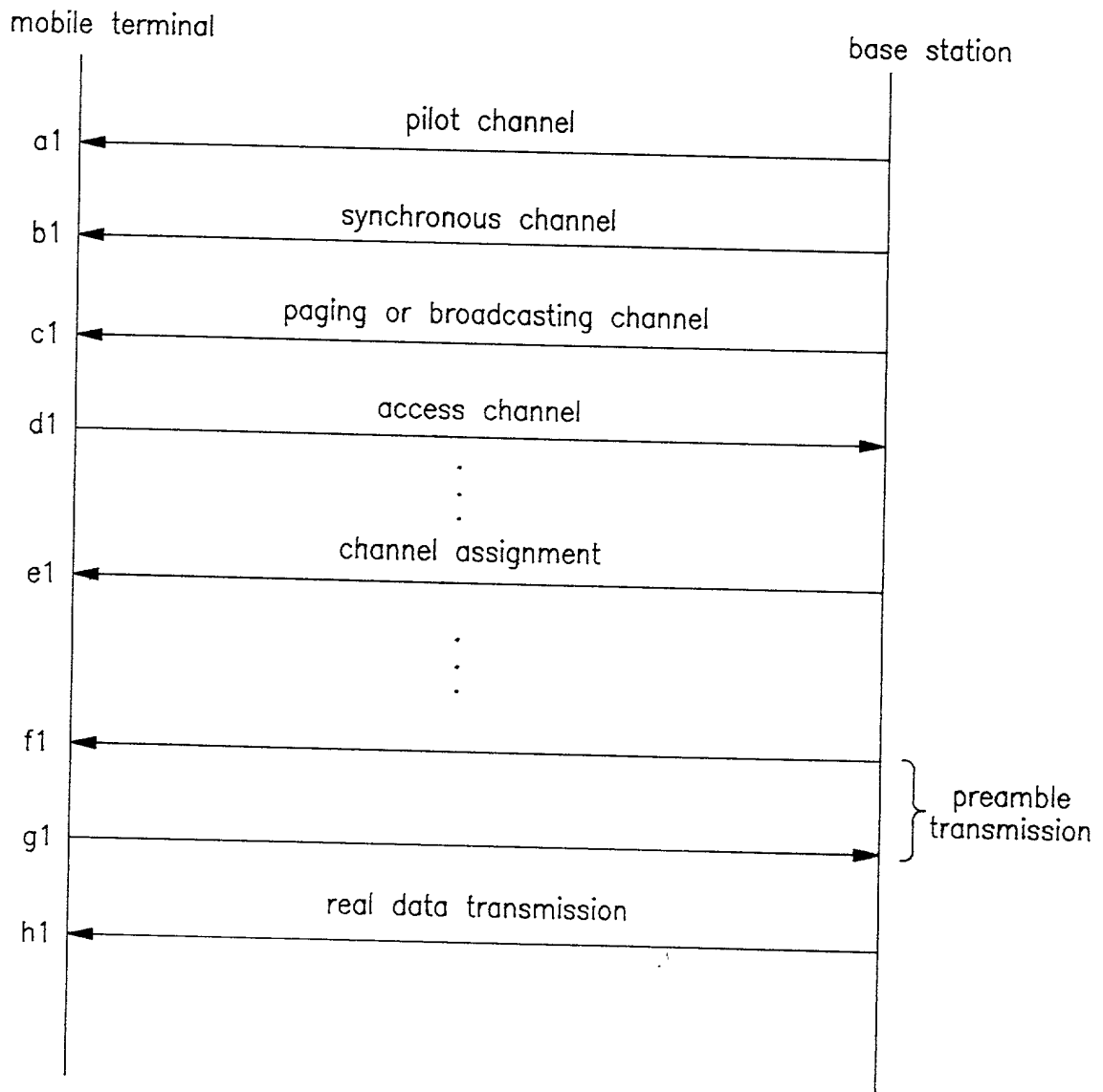


FIG.2

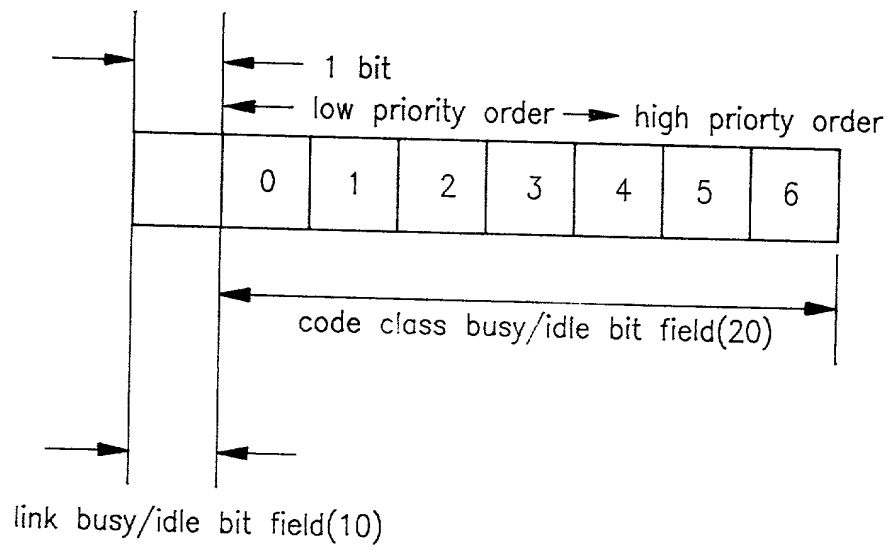


FIG.3

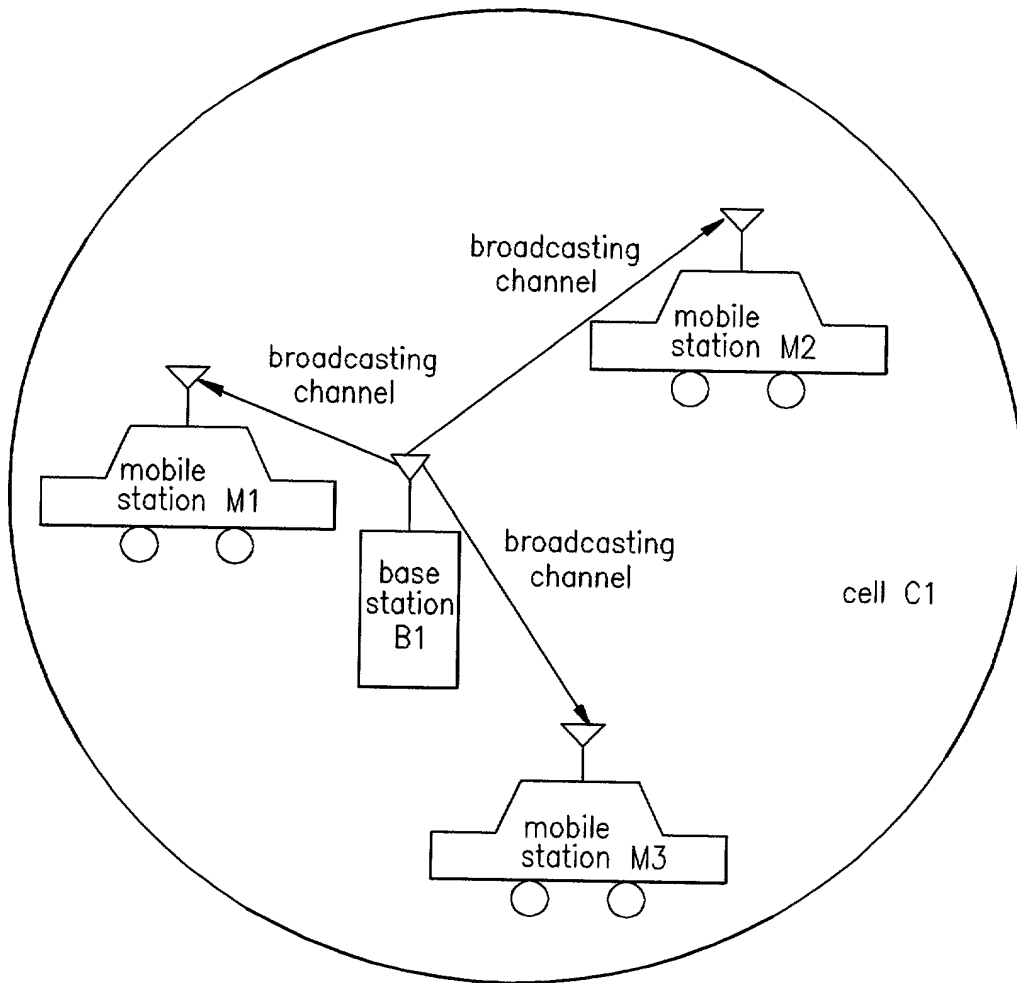
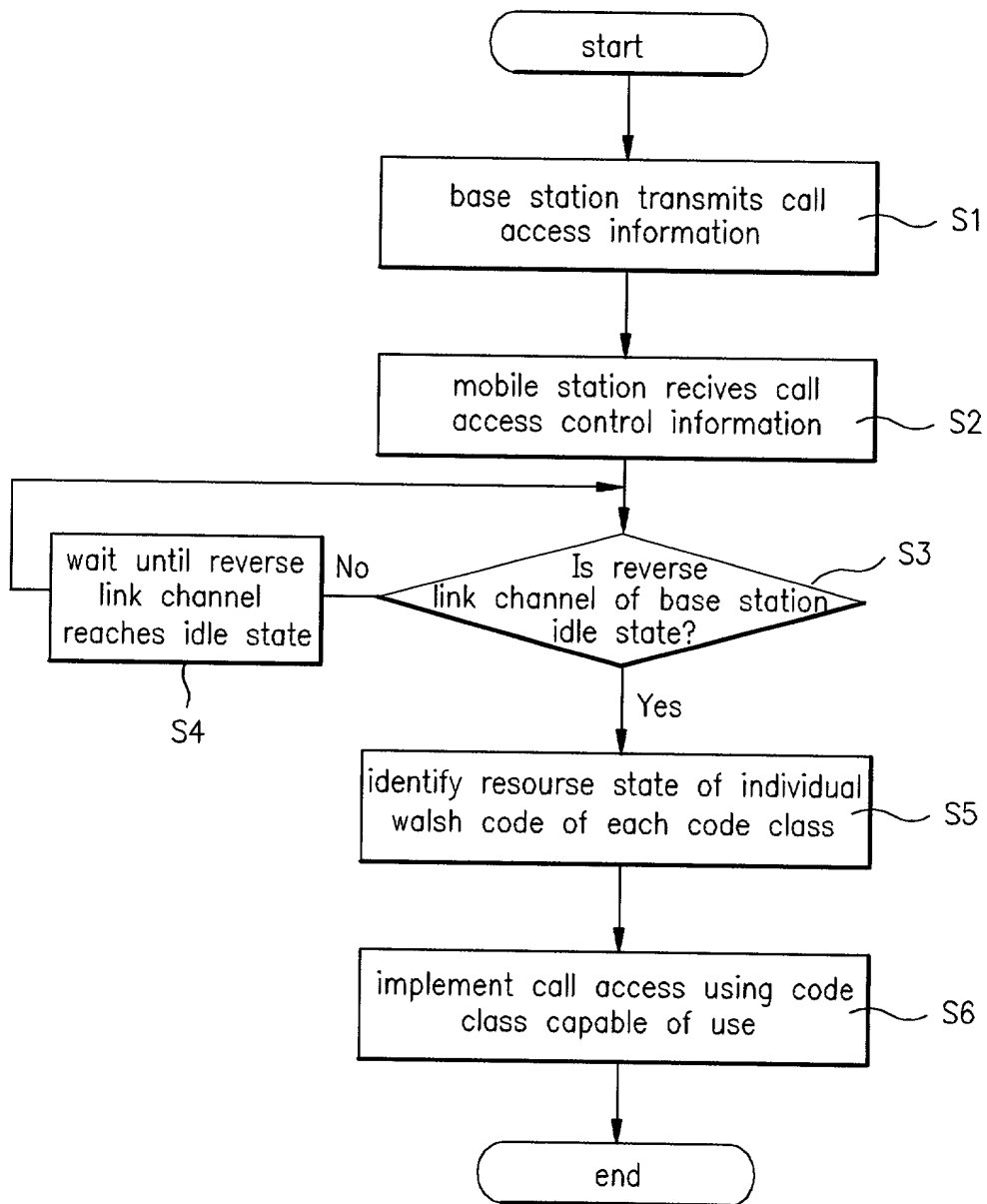


FIG.4



Docket No.: _____

DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I hereby declare that:

My residence, post office and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter claimed and for which a patent is sought on the invention entitled _____

METHOD FOR CONTROLLING CALL ACCESS OF TERMINAL IN MOBILE COMMUNICATION SYSTEM

_____ ,
the specification of which

[X] is attached hereto [] was filed on _____ as Application Serial No. _____ and was
amended on _____ (if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is known to me to be material to patentability in accordance with Title 37, Code of Federal Regulations, Section 1.56(a).

I hereby claim foreign priority or provisional application benefits under Title 35, United States Code, Section 119 of any foreign application(s) for patent or inventor's certificate, or provisional application(s) listed below and have also identified below any foreign application for patent or inventor's certificate, or provisional application(s) having a filing date before that of the application on which priority is claimed:

| Prior Foreign Application(s) or U.S. Provisional Application(s): | | | Priority Claimed | |
|--|----------------|-----------------------|------------------|-----------|
| <u>Number</u> | <u>Country</u> | <u>Day/Month/Year</u> | <u>Yes</u> | <u>No</u> |
| 1602571998 | Korea | 4/May/1998 | X | |

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, Section 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, Section 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

| Prior U. S. Application(s): | | |
|-----------------------------|--------------------|---|
| <u>Serial No.</u> | <u>Filing Date</u> | <u>Status: Patented, Pending, Abandoned</u> |
| | | |
| | | |
| | | |

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

I hereby appoint the following attorney(s) and/or agent(s): Daniel Y.J. Kim, Registration No. 36,186 and Mark L. Fleshner, Registration No. 34,596; Carl R. Wesolowski, Registration No. 40,372, John C. Eisenhart, Registration No. 38,128, Rene A. Vasquez, Registration No. 36,647, all of

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With full power of substitution and revocation, to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith, and all future correspondence should be addressed to them.

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Residence:

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Inventor's signature:

Date:

Residence:

Citizenship:

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Inventor's signature:

Date:

Residence:

Citizenship:

Post Office Address: